revolution has been established, that weight will remain constant throughout the calculation procedures.

12. To determine the number of revolutions per minute (RPM) for the shaft, use a stopwatch or a watch with a second hand and count the number of RPM's of the auger or flite-chain sprocket shaft at each control setting. If necessary, use a hand tachometer. Record these on the worksheet shown in Figure 40.

Calculations - All of the data are now available for calculating the amount of salt that will be discharged in 1 min. This is done by multiplying Column 2 by Column 3 and entering the result (discharge rate in lb/min) in Column 4.

To complete the calculation you need to know the minutes required to travel one mile at the calibration speed or at the pulse-setting rate. These values are tabulated on the worksheet. Assume that the calibration speed is 30 miles per hour; therefore, the time required for the vehicle to travel 1 mile is 2 min. This value is constant throughout the remainder of the calculation and is independent of control setting, therefore, 2.0 should be entered in Column 5 of the worksheet. Pick a calibration speed consistent with regular spreader operations.

Because it is independent of the truck speed, the quantity spread is easily calculated by multiplication of Column 4 by Column 5 to give the quantity spread in pounds per mile for the particular control setting. Enter the results in Column 6 and repeat for each control setting, using the same values for Column 5.

As an illustration of how the table is used, assume, for example, that the auger of flite-chain sprocket discharges 8 lb of salt (Column 3) each time it takes one full revolution at control setting number 4 and that the auger turns 15 times per minute (Column 2). Obviously, the spreader will put out 120 lb/min at that setting (Column 2 x Column 3 and the results entered into Column 4). Since the calibration speed is 30 mph and the time to travel 1 mile is 2.0 min (Column 5), the quantity spread per mile is the product of Column 4 x Column 5 (120 x 2.0 = 240 lb/mi). This calculation procedure should be repeated for each control setting and all data should be recorded on the worksheet.

The next set of calculations determines the distance that the spreader truck will travel for the various control settings before the complete load has been exhausted. These values are useful for checking the calibration and overall health of the spreader. In Column 7 of the calibration worksheet, enter the size of the load (lb) for the material (salt, sand, mixtures, or other abrasives). This weight should be for the material when loaded level with the top of the screens or the top of the spreader hopper. This value can be obtained either from the manufacturer or by weighing a truck full of material and entering the amount in the line provided in Column 7. This value is constant and independent of the

control setting. To determine the distance that a truck can travel at a given control setting before the load is exhausted divide Column 7 by Column 6 and enter the results in Column 8.

Calibration card for trucks - The last step in this calibration of spreaders is transfer of the results of the calculations onto a calibration card that is carried in the cab of the truck. This is simply done by copying the data from Columns 1, 6, and 8 of the worksheet onto the truck calibration card shown in Figure 41.

IN-SERVICE CALIBRATION

An in-service calibration is an excellent and simple way to determine how much material a spreader actually discharges. The following technique is especially useful for calibrating ground-speed controlled units. The technique is valid only for the controller setting used at the time of calibration and, calibration at both higher and lower controller settings, while possible by this technique, may either spread too much material or not enough material to do the job properly.

No equipment is required for this type of calibration. The technique requires, however, that the truck have a reasonably accurate odometer (± 5%); odometer accuracy can be determined by checking the truck against a measured mile. The technique also requires the knowledge of the capacity of the spreader when it is loaded with material up to the top of the screen or level with the top of the spreader hopper.

The technique requires that the spreader be set to the control setting near the desired range. The driver then spreads salt over the prescribed route and measures how far the truck goes before the load is exhausted. For trucks without ground-speed controllers, this technique requires that the driver maintain the truck speed constant at or near the desired spreader amount setting. Data for this type of calibration are entered in the calculation worksheet shown in Figure 42. To calculate the amount of material spread per mile divide Column 2 by Column 4 and enter the result in Column 5 of the worksheet. Data from this calculation worksheet should be entered on a truck calibration chart to be placed in the cab of the truck.

In-Service Check of Spreader Performance

The accuracy of calibration and the general overall health of a spreader can be checked periodically by the driver using the data from the truck calibration tables about how far a truck should travel on a full load under prescribed controller setting and vehicle speed (spreader without ground-speed controller). If for instance, his calibration chart says that the truck should go 15.5 miles at a controller setting of 4 and a speed of 30 miles per hour and the truck driver finds that he is going only 10 miles before the load is exhausted, then the driver knows that there is something wrong with the spreader and it should be remedied.

Spreader Calibration

Gate Opening _____ Truck No _____

Spreader Ident. _____ Load Size _____

Calibration Speed or Pulse Setting _____

Control Setting	Amount Spread (Lb/Mile)	Distance Per Load (Miles)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Calibration by _____ Remarks _____

Date _____ _____

FIGURE 41 SPREADER CALIBRATION CARD FOR TRUCK WITH GROUND-SPEED CONTROLLER

Agency _____ Truck No _____ Gate Setting _____ (in.)

Location _____ Spreader Ident _____ Material _____

(1) Controller Setting	(2) Load (Lbs)	(3) Truck Speed (mph)	(4) Distance Traveled With Load (Miles)	(5) Amount of Material (2)-(4) (Lb/Mile)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Calibration by _____ Date _____ Remarks _____

FIGURE 42 CALCULATION WORKSHEET FOR IN-SERVICE CALIBRATION

Table 8 TABLE FOR CHECKING SPREADER PERFORMANCE

Prescribed Spread Rate (lb/mile)	Miles traveled for full load									
	1.5 (tons)	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6
100	30	40	50	60	70	80	90	100	110	120
125	24	32	40	48	56	64	72	80	88	96
150	20	26.7	33.3	40	46.7	53.3	60	66.7	73.3	80
175	17.1	22.8	28.6	34.3	40	45.7	51.4	57.1	62.8	68.6
200	15	20	25	30	35	40	45	50	55	60
225	13.3	17.8	22.2	26.7	31.1	35.5	40	44.4	48.9	53.3
250	12	16	20	24	28	32	36	40	44	48
275	10.9	14.5	18.2	21.8	25.4	29.1	32.7	36.4	40	43.6
300	10	13.3	16.6	20	23.3	26.7	30	33.3	36.7	40
325	9.2	12.3	15.4	18.5	21.5	24.6	27.7	30.8	33.8	36.9
350	8.6	11.4	14.2	17.1	20	22.8	25.7	28.6	31.4	34.3
375	8.0	10.6	13.3	16	18.7	21.3	24	26.7	29.3	32
400	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30
425	7.0	9.4	11.8	14.1	16.5	18.8	21.2	23.5	25.9	28.2
450	6.7	8.9	11.1	13.3	15.6	17.8	20	22.2	24.4	26.7
475	6.3	8.4	10.5	12.6	14.7	16.8	18.9	21	23.2	25.3
500	6.0	8.0	10	12	14	16	18	20	22	24
600	5.0	6.7	8.3	10	11.7	13.3	15	16.7	18.3	20
700	4.3	5.7	7.1	8.6	10	11.4	12.8	14.3	15.7	17.1
800	3.8	5.0	6.3	7.5	8.7	10	11.3	12.5	13.7	15
900	3.3	4.4	5.5	6.7	7.8	8.9	10	11.1	12.2	13.3
1000	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10	11	12

Even for spreaders that are not calibrated, the rule-of-thumb figures in Table 8 are an indication of how far a truck should go with a given load of salt for a prescribed spreading rate.

As an example, if a spreading rate of 250 lb per mile is prescribed, a truck with 4 tons of salt should be able to travel 32 miles before its load is exhausted.

Table 8 can also be used to determine how much material per mile is actually being spread. For instance, suppose the truck has a load of 5 tons of salt and that it travels only 20 miles before the load is exhausted. The spreading rate from Table 8 is 500 lb/mi.

PATTERN CALIBRATION

An important part of any calibration is determining where the material finally comes to rest on the road when it is spread under normal operating conditions. Ideally, to be most effective, chemicals must be placed where they will do the most good and with a minimum amount of loss. A technique has been developed by the Michigan Department of State Highways Maintenance Methods Section, for testing the spread pattern.

For this calibration, a test section of road 24-feet wide and 100-feet long is painted onto a section of a parking lot (see Figure 43). This test section is divided into three 8-ft wide segments. The spreader to be calibrated is loaded with salt, and the truck is brought up to calibration speed before it enters the test section. Just before the truck reaches the test section, the spreader is started and salt is spread over the test pattern at the prescribed rate. After the truck passes, the salt that is lying within the center 8-ft wide lane of the road is swept up and weighed. The remaining salt in the two adjacent 8-ft wide sections of the road is also swept and weighed. Finally, salt outside of the 24-ft wide test section is swept and weighed. The sum of the three amounts of salt collected is the total amount spread on the test section. The percentage of material falling within the center 8-ft band is determined by division of the weight of material in the center 8-ft band by the total. The percentage of salt falling on the road is the sum of the material in the 8-ft lane and the two side lanes divided by the total. A truck with the desired spreading pattern will leave at least 75% of the salt within the center 8-ft band, and 95% of the salt will be within the 24-ft band.

Courtesy of State of Michigan Department of Highways

FIGURE 43 TEST ROAD SECTION FOR CALIBRATION OF SPREAD PATTERN

PART FIVE: PUBLIC INVOLVEMENT

CHAPTER VII

CITIZEN EDUCATION AND COOPERATION

INTRODUCTION

Previous sections of this manual, as well ad the Manual for Deicing Chemicals: Storage and Handling, have emphasized the mechanical tools needed by maintenance managers in handling deicing chemicals properly. This Part discusses other kinds of tools, not mechanical but just as important in helping maintenance officials.

Three broad strategies exist for improving the use of deicing chemicals. The first might be termed the technical appraoch; this has several components, such as improving equipment, improving the management of chemicals through such devices as reporting systems, and simply reducing the use of and reliance upon chemicals. Most discussion about winter maintenance, including Parts Three through Five of this manual, concentrate upon the mechanical and technical tools that maintenance officials can control most easily, such as trucks, plows, road crews, and road salt.

But these tools affect only part of the total problem or system. It can be described as "moving people and goods during bad winter weather". This system includes or is affected by many components, including roads, cars, winter driving equipment on cars, weather and weather forecasting, snow-fighting organizations, and travelers and especially drivers.

The second approach is legal or coercive. Legislators, officials of government agencies, and citizens' environmental groups seeking to reduce salt usage have recently turned to it as a means to define limits within which highway officials may operate. Part One describes the several components of the legal and regulatory framework, which is becoming more restrictive.

The third approach is educational or persuasive. It has been the least used to date, perhaps because it focuses on the majority of participants in our system of moving people from here to there--those who drive and ride over roads and highways. Clearly, their behavior in demanding services influences significantly how well or poorly road crews can do their work.

None of these three approaches can be used alone with success. Each can and should support the others. All are needed for a successful program of reducing reliance on chemicals.

This part of the manual addresses the third approach. Although maintenance managers may not greatly influence (or feel that they can influence) drivers and behavior, they should not ignore these participants in winter transport

interests, exchange experiences and pursue mutual goals. Thousands of groups exist, among them now are at least 3,000 conservation and environmental organizations. This number includes approximately 250 national and regional groups and some 400 state organizations. On the local community level, there are approximately 2,500 organizations of individuals concerned about one or more conservation or environmental problems. In addition, there are uncounted civic, church, labor, business, youth, school and women's groups which devote at least some of their efforts to environmental problems."

"Environmental organizations vary in size and range of activity. Some employ professional staffs. Some, especially on the local level, operate with volunteers. Some are concerned with a single issue, some with any and all environmental problems. While the scope and degree of their efforts vary, in total they engage in a multitude of activities on behalf of a better environment. They work for water pollution control, cleaner air, noise control, better methods of solid waste disposal, conservation of natural areas, preservation of wildlife, population control, transportation reform, pesticide control and sound resource management. Some are primarily educational groups. They educate their members and the general public through their publications. Others engage in legislative activities, stimulating their members and the public to make their pro-environmental views known to elected and appointed public officials. Some conduct meetings, workshops and seminars, and engage in political action for or against candidates. Some take legal action to assure that government and industry abide by environmental protection laws and regulations. Directly or indirectly, they bring pressure on government at all levels to enact and implement environmental protection laws and regulations."

"In sum, citizen organizations in the environmental field serve as active, articulate voices of a public which has become increasingly concerned about environmental quality. They fulfill a watchdog role. And they exert a pro-environmental influence on public opinion, on the press, on industry and on government."

Examples of effective voluntary action by citizens on environmental problems are many. Those following suggest how effectively even a few citizens, armed with determination and knowledge, can influence major governmental actions. They also suggest that citizen concern and energy can be enlisted by officials in support of important governmental programs.

system. The following discussion assembles and presents ways in which managers can develop and enlist the support of drivers and citizens, especially influential ones, for their wintertime maintenance policies.

Our sources for this discussion are several. Here, as in other Parts, we are not seeking to develop an impossible ideal; instead, we are reporting on the best current practices as we have found them being used by operating officials. Examples were gathered during field observation trips, from many talks with highway officials as well as environmental educators, and from the literature. Especially useful comments came from a panel on citizen cooperation which was part of the 13th Annual North American Snow Conference, in New York City, 1973.

Many techniques for citizen education and cooperation are potentially available. We have treated separately, in Part One, the legal framework, which serves both an educational as well as a coercive function. A manager probably cannot and should not use all of the techniques to be described. Instead, he must choose those most suited to the character of his local situation, and then adapt them to its special needs; in the process, he will probably improve these techniques in his own ways. The choice of techniques will vary, for example, according to the level of concern and knowledge of citizens in his community or jurisdiction.

Some officials may feel that citizen cooperation is nice but not absolutely necessary. Others may feel that worrying about it is not really part of the maintenance manager's job. The assumption underlying the following is that citizen cooperation is not only nice, but also useful and productive. For example, citizen attitudes can be crucial in influencing how legislators, whether they are town meeting members, city councilors, or state representatives, vote on requests by the department of public works for more funds for building salt storage sheds or buying improved spreaders. For another example, highway crews in communities where citizens make a conscious effort to stay off roads during snow removal operations can accomplish their tasks far more easily than their colleagues in communities where citizens demand unreasonable levels and speed of service.

Of course, it is difficult for maintenance managers to communicate with all citizen drivers individually. Instead, they must work through a variety of organizations, both formal and informal, both governmental and voluntary. Formal governmental organizations, such as police departments and conservation commissions, are obviously key channels for communication and education. Private voluntary organizations, such as the American Automobile Association and the League of Women Voters, offer much potential for helping managers. A 1972 pamphlet by the U.S. Environmental Protection Agency, Citizen Action Can Get Results, describes that potential well:

> "Voluntary citizen organizations have long been part of the way of life in the United States. Individuals with common interests--social, civic, cultural, religious, political, business, professional, etc.--have come together in clubs, societies, associations and groups to share these common

- Groups of concerned citizens have won battles against proposed highways which would have destroyed historic and scenic natural areas.

- A Maryland scientist worked after hours with school children in his community to mount a community-wide campaign which led to enactment of the first municipal law banning non-returnable soft drink and beer containers.

- Citizens in many cities have established recycling centers, where waste bottles, cans and newspapers are collected for shipment to reprocessing plants for reclamation and reuse.

- A Massachusetts citizens committee aroused public awareness of the environmental damage caused by deicing salts, and helped to write and pass that state's new legislation to regulate salt use.

- A citizen advisory committee in a Massachusetts town successfully supported efforts by the DPW to obtain improved snowfighting equipment.

We have assembled in an appendix the names, addresses, and descriptions of various organizations--private and governmental, national and state--having resources which maintenance managers should explore in light of their specific local situations. To identify quickly names of key persons in local voluntary private organizations, whether or not affiliated with national organizations, maintenance managers should start by contacting the environmental chairman of their local League of Women Voters or a similar well-established group; it customarily tracks such issues and the critical actors involved in them.

The general ideal of the manager influencing the habits of the driving public is, we recognize, not especially useful. He is only one, while they are many. Even with ample time and budget, he and his organization could not hope, except perhaps in small towns, to communicate with all drivers effectively. Instead, he must use a variety of natural and potential channels, both to publish his policies and to receive reactions and opinions from citizens. Figure 44 attempts to depict schematically the organizational context or world within which the maintenance manager works. He and his immediate aides occupy its center. The surrounding concentric circles display the persons and organizations, both governmental and private, with whom they have customary links; those within the road or highway department and in other government agencies naturally occupy the nearest circles. The figure suggests that the maintenance manager should consciously expand his relationships to groups in the circle farthest from the center.

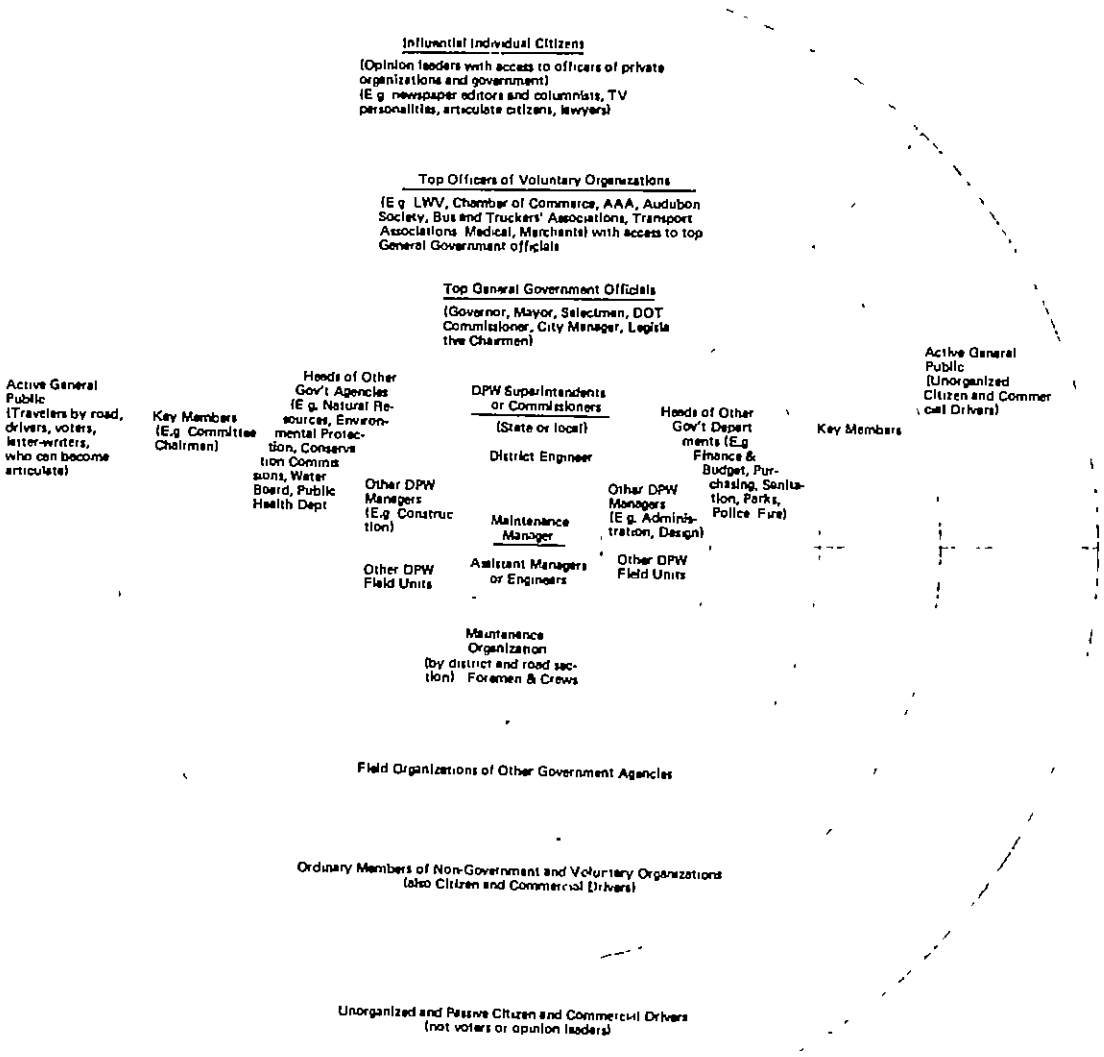


FIGURE 44 THE MAINTENANCE MANAGER'S WORLD

The following three sections discuss

- General goals and principles of a citizen education program,
- Specific tools and techniques, and
- Themes and messages.

GENERAL GOALS AND PRINCIPLES

There are many possible ways of trying to develop citizen education and cooperation. There are also many possible messages. Therefore, at the risk of stating what may seem obvious, some ideas are suggested here that should guide maintenance managers in designing programs for their own needs.

Develop Awareness

The first step in every environmental problem is to gather a base of relevant information and to share it with everyone affected. It has been easy during the past few years for concerned conservationists to point fingers of blame at highway departments when evidence of environmental injury appears. To the extent that departments of public works (DPWs) have abused reliance on salt and other chemicals, sometimes even disregarding their own stated policies, this blame is just. But to the extent that departments have merely been responding effectively to widespread citizen demands for service, when everyone was unaware of the delayed adverse injuries, the blame is misplaced.

When the use of chemicals to fight ice and snow was spreading during the 1950s and 1960s, few people in the highway community, in the salt industry, among scientists, and least of all among ordinary citizen drivers--considered or recognized the potential environmental harm which would result years later as accumulation of chemicals built up in the environment; the method of systematic search for unintended future side effects, now known as environmental impact studies or technology assessment, had not yet developed. Almost everyone applauded chemicals for the convenience they provided during wintertime, and most if not all of us were simply not aware of troubles ahead.

As citizens (including the police) became aware of the convenience and benefits of salting, they naturally urged DPWs to use it. Only later and gradually did we become aware of its delayed costs, in the forms of rusting automobiles, dying vegetation, and contaminated drinking water supplies. It will naturally require some time for citizens to become generally aware of the conflicting requirements now placed upon highway maintenance officials - for clearing roads and for minimizing harm to the environment. Until that awareness becomes widespread, highway officials will continue to receive unreasonable demands for service, which will make their wintertime work both unpleasant and difficult.

Therefore, the first purpose of an education and cooperation program must be to communicate to citizens who travel the roads, both maintenance workers and the traveling public, basic information about the problem facing the maintenance manager.

Inform Drivers About Maintenance Needs and Policies

In addition to creating general awareness, DPWs need to issue clear guidelines or policies governing use of chemicals. They must also communicate these policies to both their own workers and the traveling public. Road crews can accomplish their work more easily and efficiently if drivers cooperate during storms, by postponing trips, driving wisely, not harassing road crews, and so on. Clear statements of policy can have a threefold impact: (1) help maintenance crews in knowing when their jobs are done properly, (2) inform police officers about what road crews can and should do, and (3) guide the public in knowing what levels of service to expect.

Show Your Concern

Some critics seem to believe that maintenance officials and workers are not concerned about the negative side effects of their snow-fighting practices. This impression is generally wrong. Maintenance men are citizens, too, who want to enjoy the benefits of healthy trees and safe water. But their concern should be apparent. Citizen critics are more likely to sympathize with the problems of maintenance men if they realize that DPWs are not hostile, defensive, or unwilling to consider reasonable questions posed by citizens. In the next section, we report a number of ways in which DPWs have made their concern apparent, and have thus made their task easier.

Show Your Problems to Citizens

Few citizens have occasion to learn about the difficult problems which face maintenance men every winter--unpredictable weather, tight budgets, and conflicting demands from the public. Few, therefore, realize the complex judgments which maintenance managers must make, concerning such variables as use of contractors, balancing budgets, safety of their men, efficient use of their equipment, responsible use of chemicals, responsiveness to competing pressures from the public, and so on. So, few citizens realize that reducing reliance on chemicals is by no means a simple matter. Citizen drivers cannot learn everything about wintertime maintenance. But they can rather easily learn the main difficulties facing maintenance men. DPWs can take specific steps to educate citizens about their work--including the cooperative role which citizen drivers can play.

Long-range Education is Important, Too

Everyone naturally acts to solve the most insistent and immediate problems, such as influential officials who complain about services in particular places. But some attention should be given to educating the drivers of tomorrow. Adult drivers may be fixed in their attitudes, have little time to learn, and recall the good old days of always-bare roads. But teenagers learning how to drive have more time to learn, more incentive, and perhaps attitudes more sympathetic to environmental concerns. Attitudes and practices do not change overnight. Reliance upon chemicals developed only gradually during the 1950s and 1960s. Awareness of their side effects can spread only gradually, too. So, the time and funds needed to educate teenagers and young adults are better long-term investments than those required for older drivers. Moreover, teenagers can contribute significantly to the education of their parents and other adults. Finally, schools, especially driver education courses, offer an efficient way of reaching this important sector of the driving public.

Don't Wait, Initiate

Government officials who wait in ignorance until complaints from the public reveal a problem are likely to react defensively, too late, and with too little information. Officials should, therefore, take the initiative in educating citizen drivers, using the press and radio media as well as other techniques described in the next section. Some experienced maintenance officials have commented that the maintenance community does not use the media enough. In short, one of the maintenance manager's jobs is to educate citizen drivers. Moreover, he should, for his own sake, do so regularly and actively.

Know the Relevant Facts

This may seem obvious and presumptuous. But experience during the past few years suggest that too few maintenance officials were sufficiently aware of the environmental consequences of their chemical policy, or indeed of actual practices in their own organizations. One problem was that salt was not just used, but abused. Most citizens do not know the exact application rates prescribed by DPW maintenance manuals. But keen observers recognized instinctively that trucks were often spreading more than was required by conditions. And they were right. Random field observations and analysis of statistics revealed that trucks were often spreading twice (or more) salt than specified by the DPW's own maintenance policies. Then, simply by recording more accurately the amounts of salt spread, and without special efforts to calibrate spreaders or change policies, highway departments reduced salt usage by 20% or 30%. In short, maintenance managers were not controlling their own operations by their own standards; hence, they were vulnerable to outside criticism.

One district maintenance manager reported the benefits of knowing the relevant facts. When public complaints mounted, district officials found themselves on the defensive and unable to respond confidently, because they lacked detailed and documented records of how much salt they had spread under what weather and road conditions. In self-protection, they developed a system for recording each truck load and for monitoring by managers of overall usage. To their surprise, they discovered that they were using more salt than planned or expected. Moreover, their new recording system resulted in the reduction of usage by about 26%. The accumulating data allowed the district managers to identify problems and develop solutions. Several years later, they had improved service, reduced salt usage, learned how to respond to citizen complaints with facts rather than emotions, and reported this valuable experience to their colleagues elsewhere. Moreover, the number of complaints dropped sharply.[10]

Work Through Others

The maintenance manager cannot educate the public by himself. He should, therefore, consciously enlist the aid of many others, both officials and citizen leaders who are suggested in Figure 44. Many organizations, can offer significant resources, which would probably cost only the exercise of ingenuity and diplomacy.

Enlist Support from Your Bosses

Although this principle is really part of "work through others", above, it merits separate mention because of its importance. Maintenance leaders need support from their bosses for many reasons. Concerning snow and ice control, the chain of command is the channel through which the most important pressures arrive, for example, when public groups complain directly to the Chief Engineer, the DOT Commissioner, the Mayor, or even the Governor. These pressures naturally influence the degree of support (or criticism) the Maintenance Department receives from higher officials. Common sense dictates, therefore, that maintenance managers should enlist their superiors in their campaign to develop public education and cooperation. Your boss can be part of your problem, insofar as he represents pressures from the driving public; but he can also be turned into part of the solution, helping to cope with those outside pressures. In other words, your several bosses in the chain of command can serve as lightning rods. But they can do so only if they understand and agree with your winter maintenance policies. This you must help them do.

Enlist Citizen Support, Too

Similarly, citizen groups should be changed from part of your problem into part of your solution. Individual citizen and citizen groups that devote enough time and energy to complain are thus signaling their interest in your work. These energies can, with some patience and skill, often be turned into an asset. The next section suggests how.

SPECIFIC TOOLS AND TECHNIQUES

In this section many techniques are reported. Some are useful for towns and small cities, while others are suited only to state-level operations. We do not classify them here, but leave readers to select those most appropriate to their special conditions, for example, their available budget. Furthermore, techniques must be selected also to suit the character of the audience, which may be knowledgeable about the subject of snow and ice control or may be ignorant.

The techniques are presented according to three categories:

- Those that give or publish information to the traveling public,
- Those that get or receive information from highway and road users,
- Those that allow or encourage the exchange of information between the Maintenance Department and its public.

These techniques are listed by title in Figure 45 and then described below.

Information-Giving Techniques

Speeches and Public Appearances-

Frequently during the past several years, highway maintenance officials have been requested or required to appear before public bodies to explain their wintertime policies. The occasions have included panel discussions of highway associations, testimony before legislative commissions or committees, meetings requested by representatives of private environmental organizations, discussions in the Highway Research Board (now Transportation Research Board) of the National Academy of Sciences, and perhaps even appearances on radio and television interview shows. Such public and quasi-public appearances are perhaps relatively new in the experience of maintenance engineers, especially those that occur as the result of pressure and criticism. But they can be used as forums for citizen education. Indeed, appearances should be sought every year, as a matter of routine, in order to explain policies and practices.

Public appearances of course require time and energy, and may thus seem an added burden. Maintenance managers, however, can benefit from them in several ways. They offer opportunities for explaining their policies. They give operating maintenance officials opportunities to show their concern for environmental quality and to explain the difficulties they face. The comments and questions raised by citizens during such meetings can give managers valuable information about public attitudes and knowledge, or lack of knowledge; such information or "feedback" can guide managers in adjusting programs, as well as in educational efforts. It also helps

	Information-Giving Techniques	Information-Getting Techniques	Exchange or Interaction Techniques
EXAMPLES OF ACTIONS:	Speeches and Public Appearances Press Releases Letters to Key Persons and Groups Pamphlets and Fliers Posters and Exhibits Answering Telephone Inquiries Signs on Roads and Highways	Complaints Scan the press Surveys Public hearings	Citizen Workshops Citizen Advisory Boards Town Meetings or City Council Sessions Informal community meetings Invite citizen leaders to observe storm operations Invite environmentalists to take part in fall training session
EXAMPLES OF RESULTS:	Improved citizen understanding of: • negative impacts of over-salting • policies and procedures of highway snow maintenance • maintenance technology and its limitations • needs for driver cooperation	Improved highway maintenance department understanding of: • citizen attitudes and expectations • citizen reactions to existing practices and procedures • areas perceived by citizens as environmentally sensitive.	New agreements on how much salt should be used and where salt should be stored. New policies on which roads should be salted and with which levels of service. Change of attitude on policy, procedures, and associated costs, e.g., citizen appreciation of maintenance man's difficult job, department's appreciation of citizen concern, etc. Agreements about monitoring program. Mapping of environmentally sensitive areas. Citizen support for more maintenance money in DPW budget.

FIGURE 45 SUMMARY OF TECHNIQUES FOR DEVELOPING CITIZEN COOPERATION

managers to inform their own maintenance workers about how their efforts are viewed by the driving public. In short, one of any manager's many responsibilities is to conduct relationships between his organization and the outside world, which includes several kinds of publics, as Figure 44 suggests.

The prospect of making public appearances regularly or annually may seem too great a burden. A manager may feel that it is enough to publish his policies only once. This is wrong, however, for several reasons. Local conditions change, for example, as new roads are opened or new traffic patterns emerge. Maintenance policies will naturally change from year to year as new equipment is purchased, ideas are developed, or chemicals are tried. Perhaps most important, the audience of citizen drivers keeps changing, as new people move into the community, new drivers are licensed, and new people become active in organizations. Finally, educators have learned that once is not enough; lessons must be repeated several times before they sink in. Therefore, citizen education is a continuing job. Opportunities for speaking are potentially many. Energetic managers should seek them out, rather than merely waiting for invitations when controversy erupts.

It may seem that each meeting will require special and time-consuming preparations. This will be true, of course, for the first one or two. But thereafter, the manager's message will be well organized and constant. He will merely need to adjust his emphasis slightly to suit the character of his audience. Of course, a program of public appearances assumes that the manager has already developed a clear set of policies that he needs to make public. These policies become his message. Its form and emphasis varies according to whether he is talking to his boss, legislators, other government departments, or ordinary drivers--some of the many publics which make up the manager's world. But for all of them, the basic message remains the same. Typical occasions are listed below, and your community will probably have others as well.

High School Driver Education Classes
Town Meetings or City Council Meetings
Conservation Commission Meetings
State Legislative Hearings
Civic and Environmental Groups
Monthly or Annual Meetings of Conservation Associations, Driver Associations (AAA, ALA)
Local and Regional Transportation Groups, etc.
(Typical organizations are listed and described in Appendix A).

Press Releases-

Road superintendents in some towns have reported excellent results from a program of annual fall messages through the press (newspapers, radio, T.V.) reminding drivers of their role as winter approaches. The annual early-winter message should set forth general policies, highlight changes from the previous year, and remind citizens of their obligations. It

can, for example, explain levels of service to be provided on different kinds of roads, remind citizens to think before driving during storms, and warn merchants (for example, parking lot operators) about ordinances prohibiting them from dumping snow into city streets. These messages should always mention the good work that maintenance departments perform, the dollar cost of these services to citizens, and the benefits to their tax rate of cooperation.

One annual message, however, is not enough. Special releases should be issued before and after major storms: before, to warn of the storm and remind citizens of their role; after, to report results. Again, these releases should always include information about the dollar costs of maintenance services and the benefits which citizens receive.

Maintenance managers may feel that the press will not be interested in such releases, which admittedly are not as dramatic as news about hurricanes and murders. But they should remember two points. First, citizens who patronize the press (buy newspapers, watch T.V., listen to the radio) are always interested in what may affect them, and weather is everyone's daily concern. Second, editors are always hungry for good "copy." They welcome it especially if presented in useable form, in other words in a form which requires only minor changes before being handed to the announcer or typesetter.

Learning the form of a press release is no more difficult than learning the form of a business letter or a short talk. In essence, "the lead" or beginning paragraph should contain the most newsworthy and important point you wish to make. Other points, one in each separate paragraph, follow in descending order of importance. Paragraphs should be short; so should sentences, and even words. A short quotation can often liven up the copy. Above all, write with the interests of the reader or listener in mind. The best way to learn the basics (and also to learn about your local media) is to seek advice from a working reporter or editor; a young one will be eager to expand his or her knowledge of government and to develop potential sources of future stories.

In a 1972 pamphlet, Don't Leave It All To The Experts, the U.S. Environmental Protection Agency offered 11 tips for working effectively with the press. Although written for voluntary citizen groups, these tips apply equally to any government agency which needs to tell its story to the public.

> "The press is in the news business. The environment is news. Responsible citizen organizations in the environmental field should and can be part of this news beat. If your group is not already known to the local press, consider these approaches:
>
> 1. Get to know the press. Make an appointment to see the editor, managing editor or city editor of your newspaper and the new director of your local television and radio stations. If you have any community leaders or other well-known individuals in your membership ranks (or an Advisory Committee), try to have one or two of them accompany you on the visit.

Tell the press about your organization's objectives, programs and membership. Explain how you might be able to help them from time to time--by interpreting the technical and scientific jargon of pollution control into lay language, by evaluating the success or failure of pollution control plans, by alerting them when key environmental decisions are forthcoming, by giving them newsworthy tips, etc.

Ask if there's a particular editor or reporter you should contact when you have a potential news story. Give them the name and telephone number of the person in your organization whom they can contact.

Ask for editorial support as well as coverage in news columns. Leave them with a brief (preferably one-page typewritten) description of your organization and its programs and add them to the mailing list for your newsletter, magazine, etc.

There's no substitute for this initial personal contact. It gives you and the press an opportunity to get to know each other. It gives you the opportunity to establish your credibility.

2. Maintain your credibility. This is vital for continuing good relations with the press. Your group must be responsible, responsive, and knowledgeable in dealing with the press at all times. Don't be evasive. If you don't know the answer to a question, say so -- and offer to get it and call back. Then do so, with the answer or with a frank statement that you don't know or couldn't get the answer. Don't guess. Don't speculate. If you're telling the press something off the record, make it clear that you don't want to be quoted. But don't use the off-the-record cover to peddle false or inaccurate information.

3. Learn press deadlines. Don't call them at deadline time unless you've got a truly "hot" item. Time your press release to meet their deadlines.

4. In your press releases and conversations with the press, avoid the jargon of pollution control [and snow and ice control]. Unless the reporter covers the environment full-time, chances are you know more about the subject than he does. Be helpful by talking and writing plainly.

5. Don't issue press releases or hold news conferences unless you really have something to say. If you hold a press conference, have a release and background material available and give the press a chance to go over it before the conference begins. Don't waste the press's time by simply rehashing the press release in your oral presentation. Allow plenty of time for questions. If you really have nothing to add to the release, or if the

subject doesn't lend itself to questioning, you shouldn't hold a press conference. And don't schedule press conferences at deadline times or in competition with other local major news developments.

6. Don't tell the press what to print or broadcast; that is their business and their decision. And don't expect the press to print or broadcast every word in your press releases. Settle for a part of the story.

7. When you issue a press release, deliver it personally if at all possible. If you have to mail it, call and alert the press that a release is in the mail and brief them on the content. Don't try to read the release to them unless they ask you to. Whenever possible, get the release to the press at least one or two days before the release date. (This will not be possible under certain circumstances, of course--such as a statement from your group in response to a control agency action, a polluter's action, a legislative action, etc.).

8. If an officer of your organization is making a speech somewhere, send a copy to the press at least a day or two before, with a press release or cover note. Mark the release and the speech for release at the time and date it will be given.

9. Don't argue with the press. If you think you have a grievance, discuss it with them privately and rationally. Don't attack the press. If you have an honest disagreement on a public policy, or an editorial opinion they've expressed, present your views in a letter to the newspaper editor. If it's a radio or television station, ask for an opportunity to reply through a taped editorial comment, broadcasting's version of the letter to the editor.

10. Be sure of your facts. If you mislead the press, you can destroy your credibility and public acceptance. And consequently, your ability to influence public opinion, government and industry.

11. Be resourceful. Look for opportunities for your organization and its programs to become part of local news events, not necessarily centered on the environment and thereby receive valuable visibility."

To summarize, maintenance managers do not use the press enough. Press releases are not difficult to write and issue. Editors are always interested in information and news useful for their readers and listeners. By giving editors good and timely releases, managers can greatly increase the chances of having them used.

Letters to Key Persons and Groups-

This technique was reported successful by the superintendent of a New Jersey town. It is in reality just a refinement of the press release, a communication directed at a specific sector of the public. As fall ends and winter begins, this superintendent writes a letter, perhaps mimeographed, to owners of such businesses as garages, used car lots, and markets. He reminds them of the town ordinance forbidding owners from plowing or dumping snow onto the streets, explains the department's policies for the coming winter, and requests their cooperation in specific ways. Similar letters might also be addressed to merchants and residents in congested areas, such as shopping districts, concerning parking as well as plowing.

Pamphlets and Fliers

Many or all households in a town might be reached most effectively by using a variation of the letter technique. One or another agency of town or city government sends some kind of message--tax bills, water bills, or voting information--to almost all households. It is a small matter to add to these envelopes a flyer or a small pamphlet carrying the maintenance message. The telephone company uses this technique skillfully with its monthly memo, which subscribers find when they open their bill. State Registries of Motor Vehicles, AAA, and citizens groups might also be willing to include such fliers or "stuffers" with their regular mailings for license renewals, newsletters, and the like. A "stuffer" for utility bills from Arlington, Massachusetts is shown in Figure 46.

For example, the City of Ann Arbor, Michigan recently published a six-panel, fold-out pamphlet (shown as Figure 47) to inform its citizens of the city's new snow and ice control program designed to reduce reliance on chemicals. Note that it includes a city map, highlighting the arterial routes to be salted. It also includes tips for safe winter driving, in cartoon form, and a summary of recommendations passed by the city council. Such pamphlets can be distributed at many public meetings, and also given to visitors to a department's snow-control center.

Larger than a flyer or pamphlet, but essentially the same idea, is the pocket guide. Vermont's Department of Highways developed a simple but effective shirt-pocket guide for all drivers of snow plows, reminding them of the Department's policies. The Salt Institute several years ago published a guide in comic-book form for the same audience. Managers, or perhaps state associations of maintenance officials, could publish such pamphlets specifically for cooperating government agencies, particularly the police, parks, sanitation, and fire departments, whose personnel are greatly concerned and effected by snow-removal policies. (These guides should be used in conjunction with personal talk by managers, especially to police troopers in their barracks, to explain policies and practices).

WE'LL DO OUR BEST, BUT WE'LL NEED YOUR HELP!!

For Better Snow Plowing This Winter, We Would Appreciate Your Cooperation By:

During a snowstorm, do not drive unless ABSOLUTELY necessary.
Public transportation should be used whenever possible.
Please park your car off the street.

PLEASE HELP US TO HELP YOU!!!!!

Courtesy of Town of Arlington, Massachusetts

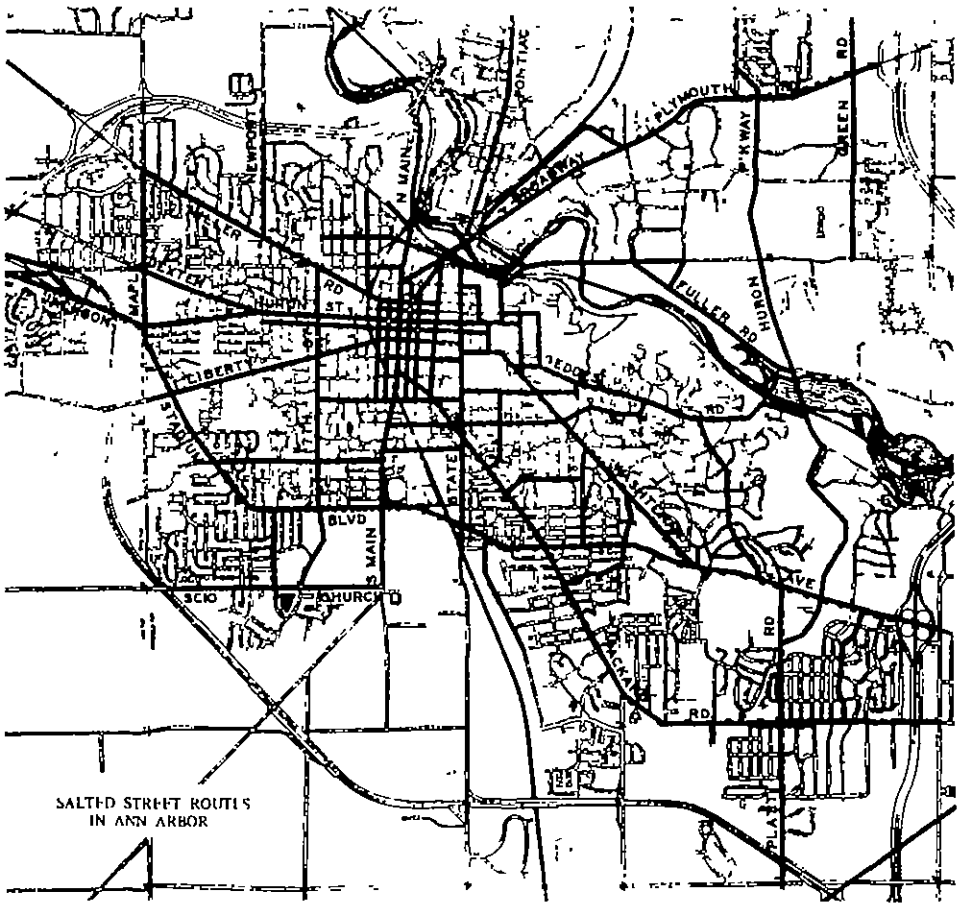
FIGURE 46 UTILITY BILL "STUFFER" CONCERNING SNOW AND ICE CONTROL

SAFE WINTER DRIVING

IN ANN ARBOR

Salt Routes
Driving Tips
City Snow and Ice Control Program
and Recommendations for Future

Winter 1970-71



Courtesy of City of Ann Arbor, Michigan.

FIGURE 47 SNOW AND ICE CONTROL INFORMATION PAMPHLET

This brochure has been printed to inform Ann Arbor citizens of the Ice and Snow Control Program for city streets The map on the right shows all city streets which receive salt as a deicing agent

Citizens are asked to study this map and plan their travel with these routes in mind Side streets and neighborhood streets are treated with a sand-chloride mixture except for steep grades which also receive salt treatment

City streets are treated for snow removal in the following order Major traffic arteries, balance of "salt routes", hills and other critical intersections, and remaining city streets.

The purpose of an ice control agent on public streets is to guarantee the safe travel of fire trucks, ambulances, police vehicles, school buses, public transportation and the riding public

Of the 75 miles of city streets receiving salt treatment 7 9 miles are state trunklines The Department of State Highways employs the city to maintain these trunklines and has ordered that all trunklines be kept open and safe for travel Thus, about 10 per cent of the city's salting program is mandatory

The city's Administrative Environmental Committee, the Mayor s Committee on Natural Resources and Interested citizens made a joint study on the use of salt on city streets, its advantages and disadvantages, and the effect of salt upon the total environment

Topics studied the effects of salt upon vegetation, surface water, pavement, corrosion of automobiles, cost differentials associated with the use of materials other than salt other alternatives to salt, educational requirements for developing a policy other than salt other alternatives to salt, educational requirements for developing a policy other than salt legal obligations and safety requirements of public streets, and policies of other governmental agencies

(See the back of this brochure for summary recommendations proposed by this joint study)

SUMMARY OF RECOMMENDATIONS ON THE USE OF SALT AS AN ICE CONTROL AGENT ON CITY STREETS

(Unanimously approved by City Council 12/21/70)

1 The use of salt should be continued this year on a REDUCED basis in a manner consistent with public safety and a view toward further reducing salt applications in the future Salt is needed this season primarily on steeper grades, intersections, and particular stretches of high intensity roadways

2 The application of salt on City streets should be monitored and records kept of the amount of salt used

3 Continue research into the overall impact of salt on the Huron River

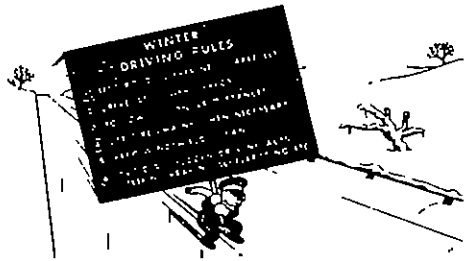
4 Continue to explore new approaches to snow and ice control and possible alternatives to the use of salt for deicing of city streets

5 Continue to make recommendations to Council regarding the most economical efficient and environmentally acceptable means of snow and ice control available

6 Council should explore additional regulations and model ordinances related to winter travel on city streets.

7 A conscientious effort should be made to educate the public on safe driving techniques on snow and ice. (Please note the map and driving tips in this brochure.)

8 Policy regarding the planting of trees and vegetation along salted streets should be studied



From the third edition of *Sportsmanship Driving* © AAA

Other Safe Winter Driving Tips

All automobile equipment should be kept in good working order

Allow a greater distance between cars for a greater braking distance avoid sudden acceleration over-steering or overbraking and remember that poor visibility and bad weather conditions require reduced speed.

If the car begins to skid steer in the same direction in which the rear end is skidding release the gas pedal and pump brakes

City Hall
City of Ann Arbor Michigan
761-2400

FIGURE 47 CONTINUED

Posters and Exhibits

Only a little effort is required to translate information in a pamphlet into large visual displays. Posters reminding drivers of winter rules can be spotted on bulletin boards in the town square, high schools, churches, post offices, banks, and so on. The city of Arlington, Massachusetts, recently used a truck body for posting the signs with good effect, as shown in Figure 48.

Answering Telephone Inquiries

DPWs talk with many citizens who call to ask for weather information, request special service, or generally to complain. Citizens who show enough initiative to telephone undoubtedly talk about their experience with others, and are, therefore, automatically influential. (Similarly, newspapers and radio stations estimate that those who take the trouble to write or call represent probably three to five others who have the same thought but do not act.) Therefore, telephone relations with the public, even though not conducted face to face, are just as important as other types of contact.

Thus, a manager should think carefully about who in the organization should handle telephone calls, and how. The man or woman on the DPW's telephone should know the locality and its roads, be familiar with maintenance, be skillful in talking with people, and be authoritative in manner. Although the department serves the public, it cannot and should not blindly say "yes" to every request or demand, especially when men and equipment are under stress during a storm. The telephone person must know the department's priorities, know the stage of operations, and, therefore be able to tell callers when they are likely to be plowed out. But he or she should not make rash promises that trucks will find difficult to fulfill or that will cause political embarassment later for other officials.

The person on the phones can do much to ensure that rules will not be too rigid. Although a town or city may accept a reduced salting program in principle, the resulting delays and inconveniences may work serious hardship on certain persons, for example, elderly shut-ins, physicians, clergymen, and emergency workers such as ambulance drivers or telephone repairmen. The maintenance chief and his telephone communicator should be prepared to give a reasonable amount of special service to legitimate callers, for example, by plowing a doctor's street early or assigning a truck part-time for special and unexpected duties. Such service is the best form of an agency's public relations; it can also make a significant contribution to an environmentally-responsible snow-removal policy.

Signs on Roads and Highways -

All of the techniques described above are forms of general education, designed to shape the attitudes of drivers. These must, however, be reinforced by signs to remind citizens while they are driving. Signs can be important safety devices, for example to warn drivers of a coming change in road conditions. Two Massachusetts towns, Burlington and

Courtesy of Town of Arlington, Massachusetts.

FIGURE 48 SNOW TRUCK WITH EXPLANATORY SIGN

Courtesy of Town of Concord, Massachusetts

FIGURE 49 WARNING SIGN

Concord, used them recently when they were experimenting with banning salt (Figures 49 and 50). (Both towns have subsequently reinstituted the use of salt in limited amounts). A more common sign on highways throughout the northern states is one warning that bridges freeze earlier than do road surfaces (Figure 51).

Signs reminding drivers to use snow tires, and possibly also chains, should be used more frequently in jurisdictions that require them by ordinance or law; this will assist police officers and judges in enforecement. In some mountainous regions, public officials go further -- requiring instead of merely advising the use of snow tires and chains. Figures 52, 53 and 54 from California are examples. This technique can be used effectively, however, only on roads where access is limited, as in mountain passes, where road crews and police can halt vehicles and inspect them. Similar potential usage exists on other controlled-access highways, such as toll roads like the New York Thruway and the Massachusetts Turnpike, where vehicles can be halted at toll plazas until dangerous conditions abate.

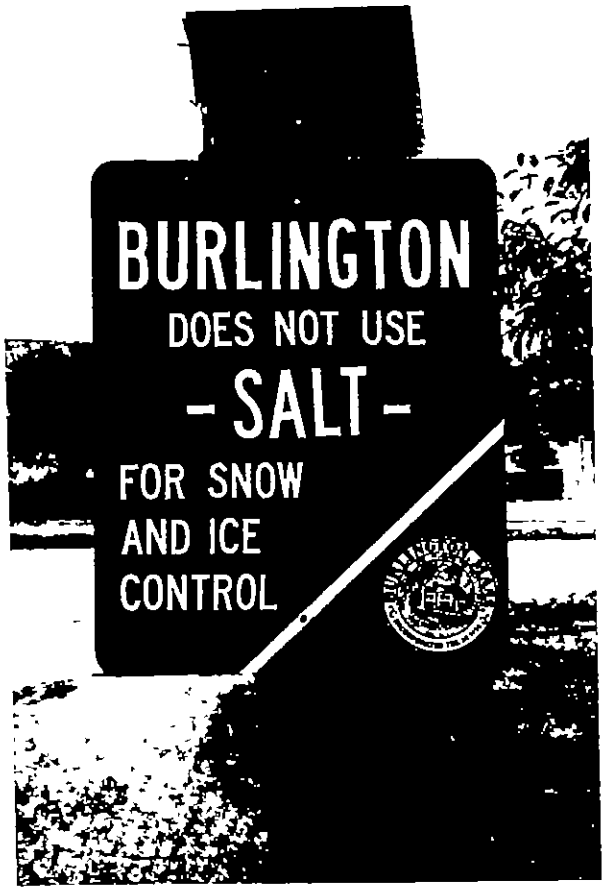
Vermont has adapted this technique for its sections of interstate highways. Figure 55 shows an advisory sign placed beside the access ramp to I-89. It can be adjusted by hand: the upper half of the pole sits loosely in the lower half, so that the local highway crew man can turn it to face entering traffic during dangerous conditions and turn it away again during normal weather. These signs are only advisory, however, and not enforced by police. Vermont authorities have not conducted research to learn whether these signs appear to influence driver behavior; but they do report from experience that the signs would better be placed beside the interstate highway itself, just at the ned of the ramp's acceleration lane, to remind through drivers already on the main line as well as to warn drivers just entering. Other states should consider adopting Vermont's practice.

Information-Getting Techniques

As the preceding list suggests, it is important to tell citizens about maintenance policies, in the hope that they will behave cooperatively. But any service organization must also receive information from its customers about the forms and quality of its service.

Complaints-

These are the most obvious sources of information from citizens. Some may seem irritating, crazy, or irrational. Some may be disregarded. But others, especially if they form a pattern, should be considered with care as a signal for a possible adjustment in policy and practice.



Courtesy of Town of Burlington, Massachusetts

FIGURE 50 WARNING SIGN

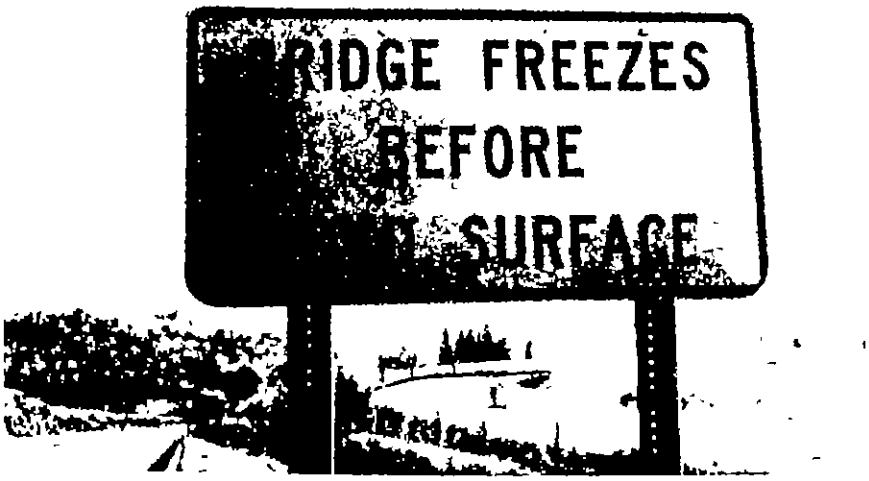


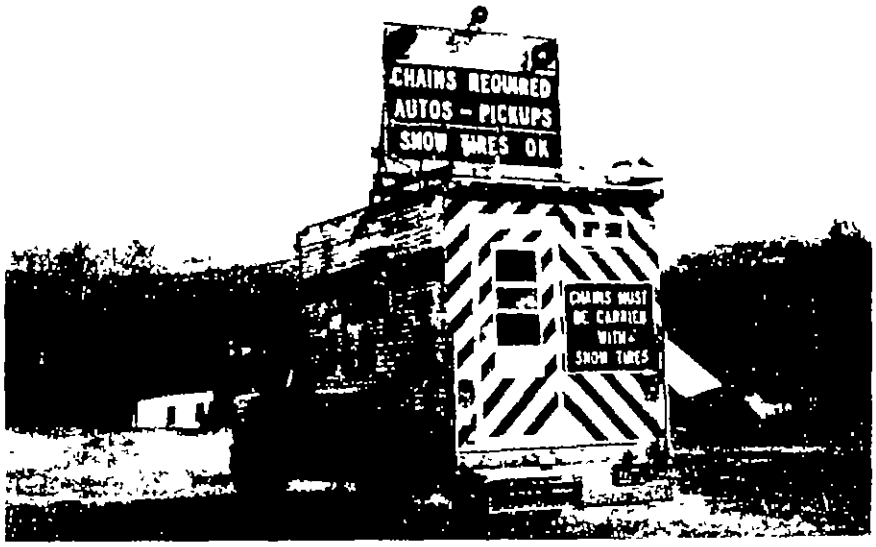
FIGURE 51 WARNING SIGN AT BRIDGE

Courtesy of State of California Department of Transportation.

FIGURE 52 REVERSIBLE SIGN: SLIPPERY CONDITIONS WARNING SIDE

Courtesy of State of California Department of Transportation.

FIGURE 53 REVERSIBLE SIGN: CHAINS ADVISORY SIDE



Courtesy of State of California Department of Transportation.

FIGURE 54 TRUCK EQUIPPED WITH SNOW WARNING SIGNS

Courtesy of State of Vermont Department of Highways.

FIGURE 55 SAFE MAXIMUM SPEED LIMIT SIGN

Scan the press -

Some information about citizen attitudes and needs is likely to appear in the daily press. Comments may be direct, as in letters about specific problems, or in editorials or columns. Some information may come indirectly, in news reports of tie-ups or comments at town meetings.

Surveys -

Research techniques developed in universities have long been used by businesses, for example, to learn about their markets. Local governments are increasingly using survey methods, including mailed questionnaires, interviews, and systematic observations, to obtain detailed information about the needs of their citizen constituency. The mechanical traffic counter, used by highway planners to gather data for origin-destination studies, is a form of survey familiar to engineers. Such techniques could be used by maintenance officials to learn the preferences of a community for various snow-fighting tools and various levels of service. DPWs could conduct mail surveys by including questionnaires in other town or city mailings, as described above in our discussion of "pamphlets," or they might enlist cooperation of Conservation Commissions or voluntary citizen environmental groups to conduct interview surveys. A variation useful in small towns is to publish the questionnaire in the local newspaper and request readers to return it by mail.

Public Hearings -

This form of obtaining citizen views has become familiar during the past decade. For example, hearings are required for reviewing environmental impact statements and water pollution control plans. Maintenance officials can use them as a device both for proposing their policies and for learning public reactions. Before initiating the hearing process, they should consult other government officials who have already conducted hearings in order to learn about the steps required for running them successfully.

Exchange or Inter-action Techniques

One-way communications are not enough to ensure citizen cooperation. Clearly, a number of the information-giving and information-getting techniques can be used for two-way communication; we shall not repeat them here. Most of the other interaction techniques need only be listed to be recognized.

Informal versions of public hearings include meetings between maintenance officials and other officials or private citizens in community meetings, with citizen advisory groups, or during citizen meetings on other environmental questions. For example, maintenance managers might ask citizen environmental leaders to convene an advisory panel to review and comment each fall on policies planned for the coming winter. Conservation officials or knowledgeable citizens can be included in annual fall training programs for maintenance crews, to encourage direct give-and-take between

truck drivers and citizen drivers. Citizen leaders can be invited to observe storm-fighting operations, both in the snow control center and on the road with crew chiefs, to learn the range of difficulty which maintenance personnel face. (This, by the way, would make a good newspaper feature article.)

Use of these interaction techniques should not be limited to non-government persons only. They should also be employed in relations between all sectors of the maintenance manager's world. They can be just as effective with environmental officials, public health officers, and police officers, as with citizens. The results of communicating with your various publics using these techniques can be many. Managers can develop support for higher appropriations, for example to finance salt storage sheds and improved spreader equipment. Managers can learn from public health officials or ground water hydrologists which areas are especially sensitive to side effects of chemicals, and probably obtain advice in devising procedures for special treatment; this has been done by state officials in Connecticut. They can develop, with citizen help, simple programs for monitoring the effects of maintenance policies on the environment and on citizen attitudes. Ordinary drivers should become more aware of practical problems facing maintenance crews. Perhaps most specifically, outside advisors can help maintenance managers in deciding which levels of service should be provided to which roads or areas, and in resolving the inevitable conflicts that surround these choices.

Laws, ordinances, and regulations are also, as we noted at the beginning of this discussion, important tools for citizen education. All of the techniques described above can be used during the process of developing regulations and laws, as well as in administering them effectively. For example, towns may not legally need to pass by-laws to conform with state laws; but conservationists have found this a useful device for focusing the attention of citizens. For a fuller discussion of the legal and institutional framework within which maintenance managers work, see Part One, "Institutional Interactions."

THEMES AND MESSAGES

The previous discussion has concentrated on tools and techniques, although some of the important messages have been mentioned in passing. In this final section, a number of messages which seem important are set forth explicitly. These were drawn from suggestions by maintenance personnel, officials of other government agencies, citizen conservationists, and our own observations.

Is this Trip Necessary?

One useful lesson of the gasoline shortage during the winter of 1973-74 was that people can indeed reduce their traveling, for example by combining trips and by car pooling. For years since the end of World War II, our economy of plenty, especially our ample supply of cheap fuel, has encouraged drivers to assume that they can travel anywhere at will.

In addition, man's apparent ability to shape and control nature's environment to suit his own convenience has encouraged the assumption that drivers can travel any time at will, regardless of weather and road conditions. But now we are being forced to recognize some limits, imposed by such factors as safety, environmental degradation, cost of fuel, and costs of maintaining roads during winter. Snow plow drivers who watch inexperienced drivers and fools slithering helplessly into snow banks naturally ask, "Is this trip really necessary?" Every winter, maintenance managers should be reminding all drivers to ask this question of themselves before every trip in stormy weather.

Drive Slowly on Hazardous Roads

This caution, although obvious, needs to be repeated often, and in various ways. One snow-plow driver for the State of New Hampshire put it well in a slogan: "It is better to be late, Mr. Motorist, than to be the late Mr. Motorist!" One benefit of slowing down appeared as a by-product of the national policy to reduce fuel consumption in 1973-74 by lowering the speed limit to 55 miles per hour: during the months that followed, according to National Safety Council reports, the rates of accidents and fatalities dropped significantly.

Only Service which is Reasonable

Since 1950, maintenance departments have striven and generally succeeded in providing excellent levels of service to drivers. They did so for a variety of reasons, in addition to the normal duty to serve: the dramatic increase in numbers of cars and trucks, their growing importance in the economy, the explosion of cities into suburbs, growth of population and affluence, decline of railroads and mass transit forms of transportation, and the advent of salt and other deicing chemicals as convenient and effective ice-fighting tools. The enthusiasm about chemicals, by drivers as well as by maintenance workers, led naturally to the concept of "bare pavements" as the standard of service. The appealing notion of "June travel in January" raised expectations that bare pavements would be available at almost all times - night and day, in bad weather as well as good. Such concepts have economic importance, for example to markets receiving supplies by truck and for ski resorts receiving customers by car while snow is falling. Maintenance departments have responded to these demands well.

In fact, they have responded perhaps too well for their own peace of mind. Few citizen drivers realize the dollar costs of such high levels of wintertime service. Only in recent years have we begun to recognize the environmental costs of heavy reliance on chemicals. As most maintenance managers know from their jangling telephones, some citizens are all too quick to complain when roads are less than bare.

Both DPWs and citizens must recognize more generally that maintenance departments cannot provide services without regard to costs, both dollar costs and environmental costs. In other words, they can provide service

only at reasonable levels. These levels of service must be clearly understood both by maintenance crews and by citizen drivers, far more so now than in the past. Only by mutual recognition of these stated standards will maintenance managers be able to feel less defensive and less harassed.

Snow Routes

If various levels of service are to be provided, it follows that particular routes will be better for traveling at particular hours. The public should know of them.

Bare Roads are Not Necessarily Safe Roads

The assumption that "bare roads are safe roads" is comforting but slippery. It has seemed a valuable rule-of-thumb for maintenance foremen; and it was certainly a valuable selling point for salt salesmen. But the idea is slippery insofar as it leads people to assume that roads are the only factor in highway safety. Clearly, the road and its condition is only one component of the system of "moving people and goods from here to there." Other parts of the system include weather, vehicles, and drivers. All are obviously important influences on safety. A clear, dry pavement is indeed preferable to a slippery, icy pavement. But drivers can drive at hazardous speeds in January as well as June, and be encouraged to do so by pavements that are clear.

It does not follow that roads covered with ice or snow are in themselves unsafe. They are unsafe only if drivers travel over them without due caution. (Incidentally, just as mariners must observe a general rule of good seamanship, drivers must observe the law that requires them to exercise good judgment in relation to conditions of road and weather. Specific requirements of law and regulation, in the form of posted speed limits, can at best only set the outside limits of behavior; within these limits, drivers must exercise discretion and judgment to suit changing conditions.)

The point that bare roads are not necessarily safe roads is important in the relations between maintenance department and their publics. Maintenance departments can only suffer from the sloppy thinking and sloppy language which suggests that, first, bare roads are somehow safe roads, and therefore second, that maintenance men are responsible for highway safety. They can be responsible for maintaining pavements in certain conditions; but they are not, and cannot be, responsible for <u>all</u> the components that influence highway safety. Although this statement seems obvious when written here, it seems to be forgotten during the stress of an accident investigation, when many persons find it convenient to point the finger of blame at road conditions and maintenance men. DPWs have responsibility, to be sure, but with limits which must be defined clearly. Clear standards of responsibility are necessary for good management, cooperation with other government departments, and healthy relations with citizens.

In some communities, especially smaller ones, candid discussions about such problems with environmental groups might result in them taking the initiative in citizen education as part of the groups' regular program.

Over-Salting is Dangerous

The ample natural resources that Americans have long taken for granted leads them to accept easily an argument that says, in effect: "If some is good, then more must be better." Only in recent years are we beginning to recognize that this logic may be fallacious.

Maintenance men with experience know that over-salting can defeat the purpose of salting. One result, during a storm, can be "slippery slush," which increases the hazards of driving. Another, after a storm, can be a residue of chemicals on the road surface; at certain places, for example low spots or shaded spots, and under certain conditions, when quickly rising temperatures of vegetation can release moisture, the deliquescence of a chemical agent such as calcium chloride can attract moisture that may freeze on contact with the colder road pavement, and thus form a thin, but hazardous, layer of ice. In addition, of course, abuse of salt and other chemicals can increase dollar costs of replacing spalled concrete, dead trees or shrubs, and contaminated water supplies.

Maintenance men should by now recognize most of these dangers. Our point, however, is that citizen drivers should learn about them also, so that they will moderate their expectations and demands for service.

Cooperation can be Reinforced by Coercion

We argued earlier that cooperation is not merely nice, but also necessary. Our discussion here has assumed that many or most drivers can and will cooperate with maintenance authorities if they are shown why and how. However, we recognize that not all drivers will comply. The police powers of government are part of the maintenance manager's arsenal of tools. He cannot use them himself, but police officers and other officials with police powers can use them in his behalf. Drivers as taxpayers should enjoy the benefits of well-maintained winter roads. But drivers as citizens also have obligations to observe laws and regulations devised for the common good, for example, limiting speed, limiting snow routes, and limiting levels of service. Maintenance managers, as part of their program of public education, should explicitly remind drivers of these obligations.

REFERENCES

1. Richardson, D.L., Campbell, C.P., Carroll, R.J., Hellstrom, D.I., Metzger, J.B., O'Brien, P.J., and Terry, R.C., Arthur D. Little, Inc., Cambridge, Mass. Manual for Deicing Chemicals: Storage and Handling, Report No. EPA-670/2-74-033. U.S. Environmental Protection Agency, Cincinnati, Ohio, 1974, 89 p.

2. Terry, R.C., Arthur D. Little, Inc., Cambridge, Mass., Road Salt, Drinking Water, and Safety: Improving Public Policy and Practices, Ballinger Publishing Company, Cambridge, Mass., 1974, 163 p.

3. Lewart, C.R., "Make Your Pocket Radio a Weather Receiver," Popular Science 201:108, August, 1972.

4. State of Minnesota Department of Highways, Maintenance Standards, 5-792-44-100, St. Paul, Minn., January 10, 1972.

5. State of Minnesota Department of Highways, Snow and Ice Removal Plan-Maintenance Area 5A, Winter 1972-1973, St. Paul, Minn., August 14, 1972.

6. Bozarth, F.M. Implementation Package for Use of Liquid Calcium Chloride to Improve Deicing and Snow Removal Operations. Federal Highway Administration, Washington, D.C., April, 1973.

7. IRAP Aid for the "Hooker" - Frink's New Snow Plow. Science Dimension (Ottawa) 5:10-13, December, 1973.

8. Washington State Highway Commission, Rubber Snowplow Blades and Lightweight Snowplows Used for the Protection of Raised Traffic Markers. Reprinted by the Federal Highway Administration, Washington, D.C., December 1973.

9. Washington State Department of Highways, Use of Rubber Snowplow Blades in Washington. Federal Highway Administration, Washington, D.C., September, 1973.

10. Chandler, P.L., and Luoto, D.C., Minnesota Highway Department. Managerial Aspects of a Chemical Reduction Program. Highway Research Record No. 425. Highway Research Board, National Academy of Science, Washington, D.C., June, 1973, pp. 77-85.

APPENDIX A

ORGANIZATIONAL RESOURCES FOR CITIZEN EDUCATION

Listed below are a selection of organizations, by name or by type, both national or local, that can assist in developing a program of citizen education and cooperation. The national offices listed can direct you to their state and local chapters or affiliates; they can often supply or suggest useful literature and audio-visual aids. In addition, look for similar kinds of local organizations or informal groups, which can offer local knowledge and resources of great value. To locate key persons in private organizations, begin by contacting the Environmental Chairman of your nearest League of Women Voters.

General Federation of Women's Clubs. 1734 N St., N.W., Washington, D.C. 20036. An organization of 51 state federations of local women's clubs and clubs in 53 foreign countries. Supports study and action programs for community betterment. Departments include conservation, education, home life, public affairs, international affairs and the arts. Publishes program materials for members.

Sierra Club. 1050 Mills Tower, 220 Bush St., San Francisco, Calif. 94104. Membership organization of 140,000 in 41 chapters. Active in legislation and litigation at all government levels devoted to the full range of environmental problems. Publishes scientific and educational studies concerning all aspects of man's environment and natural eco-systems.

The Garden Club of America. 598 Madison Ave., New York, N.Y. 10022. National organization of member clubs which promote knowledge and appreciation of conservation, horticulture and landscape design.

Izaak Walton League of America. Room 806, 1800 North Kent St., Arlington, Va. 22209. A membership organization of citizens, founded 50 years ago, which has grown to a national organization with 600 chapters. Chapter members work in their own communities and are dedicated "to the restoration and wise use of all our resources." The League assists chapter and state divisions with information, literature and professional staff services. From its earliest history the League has compaigned in legislative efforts aiding state and federal water pollution control agencies.

National Wildlife Federation. 1412 Sixteenth Street, N.W., Washington, D.C. 20036. Develops and makes available information packet, including publications list and sample publications, for primary, junior high, senior high, and college levels; publishes weekly "Conservation Report" reflecting Congressional action on environmental issues.